

SIX PENNY BRIDGE
Pennsylvania Historic Bridges Recording Project III
Spanning Sixpenny Creek
Monocacy
Berks County
Pennsylvania

HAER PA-625
PA-625

PHOTOGRAPHS

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

SIX PENNY BRIDGE

HAER No. PA-625

LOCATION: Spanning Sixpenny Creek at School Street (Old Schuylkill Road),
Monocacy, Union Township, Berks County, Pennsylvania

UTM: 18.434479.4456631, Birdsboro, Pennsylvania Quad

STRUCTURAL
TYPE: Reinforced concrete deck arch

DATE OF
CONSTRUCTION: 1907

DESIGNER: Nevin M. Davis, Berks County Engineer

BUILDER: Ferro Concrete Company, Philadelphia, Pennsylvania

OWNER: Berks County, Pennsylvania

USE: Vehicular bridge

SIGNIFICANCE: Six Penny Bridge is an intact example of an early twentieth century reinforced concrete arch bridge built by the Ferro Concrete Company of Philadelphia, an agent for Daniel B. Luten's patented designs. The bridge is an integral component of an historic mid-nineteenth century iron foundry village.

HISTORIAN: Researched and written by Lola Bennett, April-May 2006

PROJECT
INFORMATION: The Pennsylvania Historic Bridges Recording Project III is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by Heritage Documentation Programs, a division of the National Park Service, U.S. Department of the Interior. The Pennsylvania Department of Transportation funded the project.

Chronology

- 1750 Schuylkill Road laid out from the Chester County line to Reading
- 1753 Union Township created
- 1762 Pennsylvania Legislature authorizes county governments to build and maintain bridges
- 1813 William Long establishes a store near this site
- 1824 Bricklayer Joseph Aspdin of Leeds, England, invents Portland cement
- 1826 Schuylkill Canal completed
- 1852 Monocacy Furnace Company establishes an iron furnace near this site
- 1867 Paris Exposition introduces reinforced concrete to the world
- 1871 David Saylor begins production of artificial cement at Coplay, Pennsylvania
- 1872 America's first plain (un-reinforced) concrete bridge built at Brooklyn, New York
- 1875 Joseph Monier designs a 52' reinforced concrete bridge at Chazelet, France
- 1889 America's first concrete bridge built at San Francisco
- 1893 Pennsylvania's first reinforced concrete bridge built at Philadelphia
- 1900 Daniel Luten secures the first of numerous patents for reinforced concrete bridges
- 1902 Daniel Luten forms the National Bridge Company at Indianapolis
- 1903 Pennsylvania State Highway Department created
- 1906 Ferro Concrete Company established at Philadelphia
- 1907 Six Penny Bridge constructed
- 1941 State Highway 147 bypasses Monocacy
- 2002 Pennsylvania Historic Bridges Recording Project III

Description

Six Penny Bridge is a single-span, reinforced concrete closed-spandrel deck arch bridge with incised-panel parapets and curved wing walls. The bridge is approximately 66' long and 20' wide, with a clear span of 32'-0" and a roadway width of 17'-0". The arch springs from about 1' above the ground and rises 6'-6" to the crown. The arch barrel is smooth, with no evidence of ribs. The outline of the arch ring is incised and a 9" wide corbelled belt course projects approximately 5" from the face of the bridge. The roadway is flanked with 3'-6" high recessed-panel concrete parapets. An inscribed stone set in the north parapet wall reads:

SIX PENNY BRIDGE BUILT 1907

JAMES M. YERGER	
JAMES F. FISHER	COUNTY COMMISSIONERS
C.B. CLEAVER	
N.N. DAVIS	C. ENGINEER
J.J. ESHELMAN	INSPECTOR
FERRO CONCRETE CO, PHILA. PA.	CONTRACTORS

History

In 1750, the Lancaster County Court laid out Schuylkill Road along the west bank of the Schuylkill River from Reading, through Birdsboro, to the Chester County line. That road, part of the overland route between Reading and Philadelphia, was heavily traveled following the War for Independence. By the time the Schuylkill Canal was completed in 1826, the hamlet of "Mt. Airy" boasted a store, a tavern, a post office and an inn. Sometime after 1852, when the Monocacy Furnace Company established an iron furnace nearby, the village changed its name to Monocacy.

Presumably, a bridge was erected here at an early date, although no documentation has been found concerning such a structure. In 1906, severe floods damaged bridges throughout Berks County. Of the six new bridges constructed that year, one was a reinforced concrete bridge, the first of its kind in Berks County.¹

In January 1907, the Berks County Court approved contracts for nine new bridges, including one over Sixpenny Creek in Union Township.² County Engineer Nevin M. Davis prepared the plans for all nine structures, specifying that they be built of reinforced concrete, a material Davis considered "the most satisfactory and durable."³ On April 20, the newspaper reported, "The Ferro-Concrete Company of Philadelphia has men at work on the Treichlersville Bridge and the Six Penny Bridge at Monocacy."⁴ Presumably, both bridges were completed shortly after that date.

¹ Gorrell's Bridge at Douglasville was reportedly a two-span reinforced concrete arch bridge.

² "Three New Bridges," *Reading Weekly Eagle*, 12 January 1907, 7.

³ "Preparing Plans for Nine New Bridges," *Reading Weekly Eagle*, 19 January 1907, 10.

⁴ "County to Build Nine Bridges This Year," *Reading Weekly Eagle* 20 April 1907: 9.

Design

Concrete bridges first appeared in Europe in 1840 and in the United States in 1871, but the technology remained largely experimental until the end of the nineteenth century.⁵ Concrete, or "artificial stone," has little tensile strength, so early concrete bridges were constructed as solid barrel, filled arches that worked solely in compression and relied on a substantial mass of material to carry loads. Beginning in 1854, when William Wilkinson obtained a British patent for reinforcing concrete with wire rope, European and American inventors experimented with ways of combining the compressive properties of concrete with the tensile strength of iron, to produce stronger, lighter, more cost efficient structures. In 1875, French gardener Joseph Monier (1823-1906) became the first individual to apply reinforced concrete technology to bridges.⁶

In 1889, a decade and a half after Monier's pioneering experiments, concrete contractor Ernest L. Ransome (1844-1917) built America's first concrete-steel span, the Alvord Lake Bridge at Golden Gate Park in San Francisco.⁷ The modest 20' span was scored and roughened to imitate a traditional masonry bridge and even had artificial stalactites on the intrados, but beneath the facade, was a modern concrete structure, with twisted iron rods embedded in the specific zones where tension forces occur. Though not immediately popular, Ransome's concrete reinforcing system was widely used throughout the United States in the twentieth century.

Throughout the 1890s and early 1900s, other engineers, including Joseph Melan (1853-1941), Fritz von Emperger (1862-1942), Edwin Thacher (1840-1920) and Daniel Luten (1869-1945), aggressively developed and promoted the new technology. Reinforced concrete bridges were durable, aesthetic and cost effective. They used readily available materials, could be built by local laborers and did not require extensive maintenance. With the advent of the automobile and subsequent demand for good roads and bridges, reinforced concrete bridges came into their own. By 1905, reinforced concrete was the preferred material for bridges in the United States.

The development of reinforced concrete bridges in Pennsylvania coincided with national trends, with a few experimental spans in the 1890s and widespread adoption of the technology by 1910.⁸ According to the Pennsylvania Department of Transportation Historic Bridges Database, Six Penny Bridge is one of eighty-one extant reinforced concrete highway bridges constructed during the first decade of the twentieth century.⁹

Builder

Daniel B. Luten, a prolific twentieth-century bridge engineer, was highly influential in bringing reinforced concrete arches into the mainstream of bridge building. A graduate of the University

⁵ The first concrete bridge reportedly built in the world was the 39' Caronne Canals Bridge at Grisoles, France, dating to 1840. The first concrete bridge in the United States was the Cleft Ridge Span (1871-72) designed by landscape architect Calvert Vaux and built by the New York & Long Island Coignet Stone Company at Prospect Park in Brooklyn, New York.

⁶ The Pont de Chazelet (1875), a 52' reinforced concrete pedestrian bridge, still survives in France.

⁷ See HAER No. CA-33, Alvord Lake Bridge.

⁸ "Concrete Arch Highway Bridge, Philadelphia, Pennsylvania," *Engineering News* 7 (September 1893): 189-190.

⁹ A.G. Lichtenstein Associates, Inc., *Pennsylvania Historic Bridge Inventory and Evaluation*, 1997.

of Michigan, Luten taught civil engineering for several years prior to entering private practice. In 1900, he obtained the first of more than fifty patents for improvements in bridges and subsequently began promoting reinforced concrete bridges through numerous articles that were published in professional journals. In 1902, Luten organized the National Bridge Company at Indianapolis and began licensing his patented designs to agent companies around the country.¹⁰ While he constructed few bridges himself, Luten is credited with the design of thousands of reinforced concrete bridges in the United States.

Established in 1906, the Ferro Concrete Company of Philadelphia was a regional agent for Daniel Luten's patented concrete bridge designs. The company specialized in the construction of reinforced concrete buildings and bridges from 1906 until 1920 and did extensive contracting work in Pennsylvania and the Mid-Atlantic states. The Philadelphia-based firm *may* have ties to the Ferro Concrete Construction Company (1901) of Cincinnati, although no conclusive documentation has been found to determine if such a connection exists.¹¹ Six Penny Bridge is the oldest of twelve extant Ferro Concrete Company bridges identified in the Pennsylvania Department of Transportation Historic Bridge Database:

HAER PA-625	Six Penny Bridge	Berks County, PA	1907	1 span, 32'	reinforced concrete deck arch
	Hemlock Street Bridge	Dauphin County, PA	1908	1 span, 27'	reinforced concrete deck arch
	Mackeyville Bridge	Clinton County, PA	1908	2 span, 100'	reinforced concrete deck arch
	21st Street Bridge	Northampton County, PA	1909	2 span, 126'	reinforced concrete deck arch
	Urich School Bridge	Dauphin County, PA	1910	1 span, 46'	reinforced concrete deck arch
	West King Street Bridge	Cumberland County, PA	1911	1 span, 47'	reinforced concrete deck arch
	Tulpehocken Creek Bridge	Berks County, PA	1913	5 span, 209'	reinforced concrete deck arch
HAER PA-631	Roaring Creek Bridge	Columbia County, PA	1913	2 span, 97'	reinforced concrete deck arch
	Crooked Creek Bridge	Indiana County, PA	1913	1 span, 45'	reinforced concrete girder
	Walnut Street Bridge	Dauphin County, PA	1914	1 span 34'	reinforced concrete deck arch
	Stanley Bridge	Clearfield County, PA	c1915	1 span, 30'	reinforced concrete deck arch
	Shenango River Bridge	Crawford County, PA	1916	1 span, 83'	reinforced concrete deck arch

¹⁰ Cooper, James L, *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942* (Greencastle, Indiana: DePauw University, 1997), 63-64.

¹¹ In *American Building* (1968), historian Carl Condit states that the Cincinnati firm had "various branches," but he does not elaborate. For more information on the Ferro-Concrete Construction Company's origins, see Donald E. Wolf, *Turner's First Century: A History of Turner Construction Company* (Greenwich Publishing Group, 2002).

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